

Building Professional Capacity in ITS

An Assessment of ITS Training and Education Needs: The CVO Perspective



US Department of Transportation
Federal Highway Administration
ITS Joint Program Office
ITS PCB Program

August 1999

PREFACE

This report is the second in a series of needs assessment efforts conducted by the U.S. Department of Transportation's (U.S. DOT) Office of Motor Carriers & Highway Safety (OMCHS) to better understand the training and education needs of transportation professionals engaged in Intelligent Transportation Systems/Commercial Vehicle Operations (ITS/CVO). The intent of ITS is to achieve greater operational safety and management efficiency by streamlining existing processes and enhancing surface transportation systems with electronic, communication, computer, and sensing technologies. As ITS is transforming general surface transportation, it is also significantly influencing public and private sector motor carrier operations through the application of advanced information technologies, systems, and networks — commonly referred to as Commercial Vehicle Information Systems and Networks (CVISN).

The application of these new technologies and systems has required a focus on the professional capacity development needs of motor carrier transportation professionals. In 1997, OMCHS launched its first needs assessment effort in this area to capture and address immediate training needs. The effort resulted in a foundational report titled, *ITS/CVO Technical Training Program: Training Survey Report*. This report generated a series of training seminars that increase awareness of ITS/CVO and CVISN applications, develop top-level system designs for state commercial vehicle agencies, and foster skills in ITS/CVO project planning and management.

However, as states progress beyond planning and management into actual ITS/CVO deployment, operations, and systems management, motor carrier professionals require more depth and specialized skills development. This report, *Building Professional Capacity in ITS: An Assessment of ITS Training and Education Needs—The Commercial Vehicle Operations Perspective*, intends to do this.

The report builds from a thorough investigation of prior general ITS needs assessments most notably the U.S. DOT's Professional Capacity Building (PCB) Program's *Building Professional Capacity in ITS: Documentation and Analysis of Training and Education Needs in Support of ITS Deployment*. That report, hence referred to as the *ITS Training & Education Needs Analysis*, is the result of over 200 interviews conducted nationwide by the Volpe National Transportation Systems Center to systematically investigate the ITS training and education needs of transportation professionals. In that comprehensive report, twenty-seven knowledge and skill competencies were identified that are required by twenty "ideal" roles within an ITS project team for seven different types of transportation agencies (though none were motor carrier agencies).

The review of that report by OMCHS staff revealed common roles and knowledge/skill competency areas that could be applied to motor carrier ITS project deployment and operations. For example, like other ITS deployments, ITS/CVO projects require conformity with the National ITS Architecture. However, ITS/CVO have additional and unique requirements that have resulted in an ITS/CVO component of the National ITS Architecture, thus requiring the need for further and more specialized training for professionals engaged in ITS commercial vehicle activities.

Building Professional Capacity in ITS: An Assessment of ITS Training and Education Needs—The Commercial Vehicle Operations Perspective presents a preliminary assessment of ITS/CVO competencies and roles using the *ITS Training & Education Needs Analysis* as a general working framework. It is substantiated with information from site interviews conducted for other ITS/CVO studies including:

- *Electronic Credentialing for Commercial Vehicle Operations: A Cross-Cutting Study*. August 1999.
- *Early Institutional Lessons from the Commercial Vehicle Information Systems Networks (CVISN) Model Deployments: Checklists for Success*. October 1998.
- *ITS/CVO Technical Training Program: Training Survey Report*. November 1997.
- *ITS/CVO Technical Training Program Work Plan*. January 1997.

Additional resources supplied by OMCHS included job descriptions for CVISN project team members and ITS/CVO course materials. A more in-depth review also revealed unique differences inherent in ITS/CVO as compared to general surface transportation which are documented in this report.

Building Professional Capacity in ITS: An Assessment of ITS Training and Education Needs—The Commercial Vehicle Operations Perspective presents these commonalities and differences for two primary purposes:

- First, to provide a guide for decision makers within commercial vehicle regulatory agencies who have the responsibility for staffing, hiring, and training professionals for ITS/CVO projects. It proposes "ideal" project teams and their required competencies for four ITS/CVO functional areas:
 - Safety Information Exchange,
 - Electronic Credentialing,
 - Electronic Screening, and
 - Motor Carrier Operations.
- Second, it will benefit the OMCHS' ITS/CVO Program and the U.S. DOT's ITS/PCB Program in further developing education and training offerings to assist transportation professionals addressing ITS/CVO training needs.
- Third, it lays a framework so that OMCHS can proceed with a more in-depth analysis that captures not only the specifics of current needs, but identifies the emerging needs of this rapidly evolving field.

Reports conducted as part of the U.S. DOT's PCB Program and available on its web page at www.its.dot.gov/pcb/pcb.htm include:

- *Building Professional Capacity in ITS: An Assessment of ITS Training and Education Needs—The Commercial Vehicle Operations Perspective*. In partnership with OMCHS. (EDL #10824).

- *Building Professional Capacity in ITS: Guidelines for Staffing, Hiring, and Designing Ideal Project Teams (EDL #8966).*
- *Building Professional Capacity in ITS: Guidelines for Designing an Individualized Training and Education Plan (EDL #8965).*
- *Building Professional Capacity in ITS: Guidelines for Developing the Future Professional (EDL #8967).*
- *Building Professional Capacity in ITS: An Assessment of ITS Training and Education Needs — The Transit Perspective (EDL#8968).*

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1.0 INTRODUCTION

The focus of the ITS/CVO program—to create a way for existing and newly designed systems to exchange information using standards and available communications infrastructure—poses new institutional and technical requirements that decision makers must address when developing organizational professional capacity. For example, ITS/CVO deployments require unprecedented cooperation among public sector agencies, necessitating new skills in partnering and building coalitions. Public sector officials also need to understand how to make technology choices among information, communication, and computer applications, as well as understand their integration with existing legacy systems. This report is designed to assist motor carrier transportation officials in acquiring these knowledge and skills.

The report is organized into five sections:

Section 1 is this Introduction.

Section 2 provides a definition of professional capacity building and presents its three "building blocks"—ITS roles, ITS competencies, and delivery methods—which are essential for determining the right mix and level of learning that is needed by individuals or staffs in the implementation of ITS projects. It discusses each building block in length and places them within the context of the ITS/CVO program. Additional ITS/CVO roles, competencies, and delivery methods that are not included in the *ITS Training & Education Needs Analysis* are introduced and defined.

Section 3 presents staffing charts for four ITS/CVO functional areas:

- Safety Information Exchange,
- Electronic Credentialing,
- Electronic Screening, and
- Motor Carrier Operations.

The charts identify the combination of staff by position title. They also include, by position, a summary of functions and responsibilities and a recommendation for supporting ITS competencies. The section also looks at the range of delivery methods that are most effective for learning ITS motor carrier operations.

Section 4 summarizes this report's findings and discusses how well the current ITS/CVO Program and the ITS/PCB Program meet the education and training needs of ITS/CVO professionals. This discussion preliminarily identifies gaps in the education and training offerings in what is currently available.

Section 5 focuses on recommendations to strengthen the ITS/CVO and ITS/PCB Program training offerings to address the identified gaps in Section 4. These recommendations include

amending courses to include ITS/CVO information and case studies, adding case studies and lessons learned to existing ITS/CVO courses, and developing new ITS/CVO courses to meet emerging areas needs. Non-traditional delivery methods such as technical assistance and virtual learning are discussed as a means of broadening and deepening the current ITS/CVO Program and ITS/PCB Program offerings.

In conclusion, this report recognizes that synthesizing information from previous assessments and studies provides a starting point for understanding the more unique ITS/CVO needs. However, to validate and substantiate the ITS/CVO competencies and roles introduced in this report, further needs assessment that includes interviews with ITS/CVO practitioners is recommended. Therefore, this report concludes with a recommendation for OMCHS to conduct a more in-depth needs assessment to refine the roles, competencies, and preferred delivery methods introduced in this report to be specific to ITS/CVO.

2.0 OVERVIEW: BACKGROUND

2.1 Definition of ITS Professional Capacity Building (PCB) & Commercial Vehicle Operations (CVO)

Professional capacity building is the process of developing new or enhancing existing knowledge and skills that are required for successful performance in a job. ITS is the enhancement of surface transportation systems and operations using electronic, communication, computer, and sensing technologies. ITS/CVO is the application of these advanced technologies to motor carrier operations. For example, safety information gathered at roadside inspection sites can be electronically transmitted to state administrative offices for safety enforcement activities.

Clearly, the application of ITS to surface transportation requires transportation professionals at all levels to incorporate and apply new competencies in their daily work activities. Rapid technological advances also necessitate that transportation professionals search for, and access, education and training that will enable them to remain professionally current. Both the ITS/PCB Program and ITS/CVO Program are designed to assist transportation professionals in achieving these goals.

Building professional capacity in ITS relies upon the use of three "building blocks" that help professionals determine the right mix and level of learning that they need. The three PCB building blocks are:

- **ITS Roles** - the ideal ITS functions and job positions within a transportation agency and/or on an ITS project team.
- **ITS Competencies** - bundled sets of applied knowledge and skills that support successful job performance.
- **Delivery Methods** - the most accessible ways for professionals to learn about ITS. The ITS/PCB Program relies on methods in four categories - training, education, technical assistance, and information outreach.

The PCB building blocks presented in this report are comparable to those that were identified in the *ITS Training & Education Needs Analysis*. However, they have been modified to reflect how they apply to the ITS/CVO program. Additional ITS/CVO roles and competencies are also introduced. Two building blocks — roles and competencies — serve as the backbone to the staffing charts presented in Section 3. The range of delivery methods appropriate for the ITS/CVO program is also discussed in this section, as the 21st century workforce demands that knowledge and skill development be accessible where and when needed.

2.2 Building Block #1: Range of ITS/CVO Roles

The *ITS Training & Education Needs Analysis* defines a set of "ideal" ITS team roles that professionals play individually and as members of agency and project teams in ITS deployment and operations. The range of ideal ITS team roles which are needed for ITS/CVO program implementation is listed in Table 1. Definitions for the roles listed in Table 1 that are similar to those in the *Building Professional Capacity in ITS: Documentation and Analysis of Training and Education Needs in Support of ITS Deployment* can be found in that document. Some of these definitions need to be refined to include ITS/CVO activities which can be done in a further needs assessment based on interviews with ITS/CVO professionals. A table of fourteen unique ITS/CVO roles with definitions is included in this report in Appendix A. The roles focus on public sector and contractor positions that are active in ITS/CVO deployment. Private sector roles such as motor carrier drivers, dispatchers, and lobbyists have not been included in this report since its focus is predominantly on public sector transportation officials who staff and train project teams. The exception is the Motor Carrier Industry Representative that is involved in project planning and acceptance of ITS/CVO technologies.

Many of the additional roles emerged due to functional areas of the ITS/CVO Program. These areas are Safety Information Exchange, Electronic Credentialing, Electronic Screening, and Motor Carrier Operations. Commercial Vehicle Information Systems & Networks (CVISN) program's Level 1 Capabilities represent basic ITS deployments and functionality in the first three areas. As well, the public sector or State and Federal governments, have the lead responsibility for implementation in these areas. The fourth area, Motor Carrier Operations, consists of motor carriers using ITS technologies to improve the safety and efficiency of their business operations. An example is a motor carrier's use of Global Positioning Systems with on-board computers for fleet management and package tracking functions. Both the public and private sectors need to be aware of ITS developments in all four areas so that their systems can be cost-effectively and voluntarily integrated to improve highway safety and motor carrier productivity.

In addition, there are ITS/CVO activities that include interfaces with ITS functional areas such as Advanced Traffic Information Systems, Advanced Transportation Management Systems, Advanced Rural Transportation Systems, and Electronic Toll Collection. Commercial vehicle interactions in the first three areas include the relaying of roadway weather, and incident and traffic information to motor carrier truck and bus dispatchers to assist drivers in avoiding dangerous and congested areas. The first three areas are covered in *Building Professional Capacity in ITS: Documentation and Analysis of Training and Education Needs in Support of ITS Deployment* and so will not be addressed here. Electronic Toll Collection technologies allow motor carriers to pay highway tolls using in-vehicle transponders. OMCHS is working to establish national interoperability of transponders so that the number of transponders used by interstate motor carriers can be minimized.

The *ITS Training & Education Needs Analysis* interviews revealed that during the deployment and operation of an ITS-related program, individuals' jobs require them to wear multiple hats, that is, to play more than one role. For example, the project manager of an ITS/CVO project will frequently have responsibility for planning and/or budgeting as well as project management. Furthermore, some roles such as project managers and system architects, are actively involved throughout all the stages of deployment. It is for these reasons that the *ITS Training & Education Needs Analysis* categories — "Cross-Cutting Roles" and "Creating Change: Roles for Mainstreaming ITS" — have been merged into the "Roles in Developing a Regional ITS Concept of Operations and Planning for ITS" and "Roles in the Design, Procurement, Installation, Operations & Maintenance, and Evaluation Stages" in this report. As well, some of the roles appear in different deployment categories from those in the *ITS Training & Education Needs Analysis* given their unique participation in ITS/CVO activities.

So far, fourteen roles have been added which are specific to ITS/CVO and different from the *ITS Training & Education Needs Analysis*. They are: Project Manager; System Architect; ITS/CVO Champion; Project Facilitator/Administrator; FHWA Resource Center Specialist; Motor Carrier Industry Representative; State & Federal Legislators; State Agency Decision Maker; System Administrator; Budget Officer; Operations Supervisor for Tax & Vehicle Registration Programs; Operations User for Tax and Vehicle Registration Programs; State & Local Motor Carrier Inspectors; and Electrical Engineer. The roles have been loosely ordered according to when they are determined to be critical in project deployment.

Table 1: Ideal ITS/CVO Roles

<u>Roles in Developing a Regional ITS Concept of Operations and Planning for ITS/CVO</u>	<u>Roles in the Design, Procurement, Installation, Operations & Maintenance, and Evaluation Stages</u>
<ul style="list-style-type: none">• ITS/CVO Champion• Project Manager• System Architect• Project Administrator/Facilitator• Planner• FHWA Division Field Staff• FHWA Resource Center Specialist• Motor Carrier Industry Representative• State & Federal Legislators• State Agency Decision Maker	<ul style="list-style-type: none">• System Administrator• System Support & Maintenance Technician• Software Developer• Human Resources Staff• Contract Specialist• Legal Staff• Budget Officer• Data(base) Manager/Analyst• Operations Supervisor for Tax & Vehicle Registration Programs• Operations User for Tax & Vehicle Registration Programs• State & Local Motor Carrier Inspectors• Electrical Engineer• Electronics Inspection & Maintenance Technician

2.3 Building Block #2: ITS/CVO Competencies

ITS competencies encompass the technical and institutional knowledge and skills required across the stages of project planning, design, and deployment through systems operations and maintenance. The range of ideal ITS competencies which are needed for ITS/CVO program implementation is listed in Table 2. In most cases, the ITS competency areas that were identified for the *ITS Training & Education Needs Analysis* are applicable to ITS/CVO. Definitions for these competencies are in *Building Professional Capacity in ITS: Documentation and Analysis of Training and Education Needs in Support of ITS Deployment*. However, in a number of instances, these competencies will need to be modified or redefined to better reflect the requirements of ITS/CVO practitioners. So far, ten competencies have been added which are specific to ITS/CVO and are defined in Appendix B. The ten unique ITS/CVO competencies are: ITS/CVO Awareness; National ITS Architecture & CVO Component; Telecommunications Networking Options; System Integration; Electronics; Budgeting; State & Federal Motor Carrier Tax & Vehicle Registration Regulations, Procedures, and Processes; State and Federal Inspection Procedures and Processes; System Testing; and Interoperability Testing for Conformance to the National ITS Architecture & Standards.

The current suite of ITS/CVO Program courses focus on competencies needed for the four functional areas. However, emerging areas, such as Interoperability Testing and Conformity to the National ITS Architecture & Standards, will require development of new courses. This will be imperative since all Federally-funded ITS projects will have to be in conformance with the National ITS Architecture and accepted standards. Information on future accepted standards will also need to be included in courses. Other courses that provide ongoing training in deployment such as program management and evaluation will also support ITS/CVO practitioners in their projects.

Many roles require the same competencies, but at varying levels. For example, planners, system architects, and system support and maintenance technicians must all understand system integration. However, the depth of knowledge and the skills for application vary across a range of basic awareness to knowing how to integrate components together through wireline and wireless media. These differences are covered in the staffing charts in Section 3 with recommend competencies at either the awareness or specialized levels.

Table 2: Range of ITS/CVO Competencies

<u>Competencies for Developing a Regional ITS Concept of Operations</u> <ul style="list-style-type: none">• ITS/CVO Awareness• Identifying Stakeholders/Building Coalitions• National ITS Architecture & CVO Component• Partnerships• Financing• Planning	<u>Cross-Cutting Competencies</u> <ul style="list-style-type: none">• Project Management• Writing/Communications• Problem Solving
<u>Competencies for the Design, Procurement, Installation, Operations & Maintenance, and Evaluation Stages</u> <ul style="list-style-type: none">• System Analysis & Design• Technology Options• ITS Standards• System Integration• Software and Hardware Operations• Software Development• Telecommunications Networking Options• Electronics• Human Factors• Procurement• ITS Legal Issues• Budgeting• Managing Contractors• State & Federal Motor Carrier Tax & Vehicle Registration Regulations, Procedures, and Processes• State and Federal Inspection Procedures and Processes• System Testing• Interoperability Testing for Conformance to the National ITS Architecture & Standards• Data Analysis & Management• System Support and Maintenance• Project Evaluation	<u>Creating Change: Competencies for Mainstreaming ITS</u> <ul style="list-style-type: none">• Legislative and Policy Changes• Organizational/Institutional Changes• Policy/Political Environment• Marketing/Public Relations

2.4 Building Block #3: Range of Delivery Methods for Learning ITS and ITS/CVO

One of the most important areas of ITS professional capacity building is using the delivery method that most effectively allows learning to be tailored to, targeted for, and accessible to professionals. In today's fast paced business environment, the more traditional methods of learning, such as training courses or educational classes, don't always meet the needs of professionals who need information and instruction on-the-job and just-in-time.

ITS Training & Education Needs Analysis interviewees made it evident that professionals who were most successful at learning about ITS did so through a wide variety of learning methods. They attended conferences and were on ITS-related committees (information outreach). They participated in ITS Scanning Reviews, arranged their own visits to sites with ITS deployments, and called peers about experiences and problems (technical assistance). Many of the interviewees attended ITS/PCB Program's courses and seminars (training).

To continue to support ITS practitioners' professional capacity building needs, the ITS/PCB Program will increase its delivery offerings beginning with making courses and seminars available on the web in September 1999. It is also preparing to provide the courses via satellite. For a compendium of ITS/PCB resources available, see *Building Professional Capacity in ITS: Documentation and Analysis of Training and Education Needs in Support of ITS Deployment*.

The OMCHS will continue to offer its array of ITS/CVO awareness and specialized training courses. It will also continue its information outreach activities that include the ITS/CVO Technology Truck that tours the nation exhibiting advanced technologies for motor carrier operations. Technical assistance for ITS/CVO deployments is provided by FHWA Division Field Staff and FHWA Resource Center Specialists. In addition, the Peer-to-Peer Network has been broadened to include ITS/CVO participants. Table 3 provides a comprehensive list of the current and potential methods available for delivering ITS/CVO learning. Current delivery methods are in regular typeface; those in italic are potential methods.

Table 3: Range of ITS/CVO Delivery Methods

<u>Training</u> <ul style="list-style-type: none">• Traditional classroom style.• Cross-agency training.• Job rotation or exchange program with agencies, professional associations, or private sector firms.• <i>Computer-based training (CBT).</i>• <i>Web-based training (WBT).</i>• <i>Satellite broadcast of a course presentation.</i>• <i>Industry internships for public sector officials to earn technology from vendors.</i>	<u>Technical Assistance</u> <ul style="list-style-type: none">• Assistance from FHWA Division Field Staff and FHWA Resource Center Specialists.• Mentoring.• Peer-to-Peer Network.• Consultant/Contractor assistance for hands-on technical assistance.• ITS Scanning Reviews.
<u>Information Outreach</u> <ul style="list-style-type: none">• Web sites with reports, information, and access to technical assistance. These include the FHWA/OMCHS web site, the U.S. DOT's ITS Joint Program Office web site and Electronic Data Library, and electronic newsletters such as the ITS Cooperative Deployment Network.• Reports on best practices, lessons learned, and successful approaches.• Vendor-sponsored programs such as displays, exhibits, and training.• ITS/CVO Technology Truck.• National and State Motor Trucking Associations such as the American Trucking Associations Foundation conferences and meetings.• Original Equipment Manufacturer conferences such as Society for Automotive Engineers.• National Private Truck Council meetings.• Commercial Vehicle Safety Alliance and American Association of Motor Vehicle Administrators symposiums and forums.• State Commissioner meetings to reach high-level decision makers.	

3.0 IDEAL ITS/CVO FUNCTIONAL AREAS AND STAFFING CHARTS

The purpose of the staffing charts is to provide transportation officials with an additional tool for identifying the composition of "ideal" teams for ITS/CVO projects. They can also be used in considering whom to employ and for identifying the appropriate contract support. This section focuses on the "ideal" staffing for the four ITS/CVO functional areas:

- Safety Information Exchange,
- Electronic Credentialing,
- Electronic Screening, and
- Motor Carrier Operations.

The goal in each of these areas is to create electronic linkages using advanced communication and computing technology that will lead to the free flow of information among carriers, shippers, government agencies, insurance companies, and other motor carrier stakeholders. This flow of information will enhance safety, vehicle registration, and tax enforcement while improving efficiency of commercial vehicle business transactions and operations.

Other ITS functional areas that have interfaces with ITS/CVO activities, such as Advanced Traffic Information Systems, Advanced Transportation Management Systems, or Advanced Rural Transportation Systems, are covered in *Building Professional Capacity in ITS: Documentation and Analysis of Training and Education Needs in Support of ITS Deployment*. A further needs assessment will be required to better understand Electronic Toll Collection systems.

Each of the following staffing charts depicts the ideal ITS/CVO deployment and operations team with core and support participants. Core and support members are listed in Table 4. Core participants parallel the OMCHS recommended CVISN core project team. These individuals are expected to participate in the CVISN Deployment Workshops in which the State's CVISN Project Plan and Top-Level Design for Safety Information Exchange, Electronic Credentialing, and Electronic Screening are developed. Support participants are expected to assist core staff in planning, deployment, operations, and maintenance activities. Motor Carrier Operations core and support staff charts were organized in consultation with OMCHS.

For each core and support role, the competencies that are required to meet performance objectives are identified. The charts also identify the level of knowledge — either awareness or specialized — that an individual would be expected to have to contribute satisfactorily to the ITS/CVO project. *Since each ITS/CVO State has engaged different agencies with different organizational structures to implement the program, the charts should be viewed as a composite model, providing a baseline to guide staffing and professional capacity building at an organizational level. Depending on the State's organizational structure, core and support staff can come from numerous agencies including, but not limited to, State departments of transportation, revenue or taxation and public safety agencies, and the public utility commission.*

Table 4: Core and Support Staff

Core Staff	Support Staff
<ul style="list-style-type: none"> • Project Manager • System Architect • Project Administrator/ Facilitator • System Administrator • Operations Supervisor for Tax & Vehicle Registration Programs • FHWA Division Field Staff • Motor Carrier Industry Representative 	<ul style="list-style-type: none"> • Software Developer • System Support & Maintenance Technician • Operations User for Tax & Vehicle Registration Programs • ITS/CVO Champion • FHWA Resource Center Specialist • Planner • Human Resources Staff • Contract Specialist • Legal Staff • State & Federal Legislators • State Agency Decision-Makers • Budget Officer • Data(base) Manager/Analyst • State & Local Motor Carrier Inspectors • Electrical Engineer • Electronics Inspection & Maintenance Technician

3.1 Generic Staffing Chart

Since many of the same team members are involved in Safety Information Exchange, Electronic Credentialing, and Electronic Screening to achieve CVISN Level 1 Capabilities, a generic staffing chart is first presented. The roles and competencies that are unique to these three areas are then presented under their own subsection. Motor Carrier Operations has its own separate staffing chart.

Table 5A: Generic Staffing Chart for Deploying & Operating Safety Information Exchange, Electronic Credentialing, and Electronic Screening Systems (Core Staff)

Ideal Team	Functions	Competencies
Project Manager	<ul style="list-style-type: none"> • Determine scope of deployment with investment analysis. • Involve all stakeholders and form working groups. • Oversee the development of the CVISN Project Plan. • Assist with testimony to the appropriate legislative committees regarding the project. • • Secure Federal and State financing. • Ensure that proper documentation is processed and appropriately submitted for all Top-Level Design decisions. • Staff, budget and schedule project activities. • Provide oversight in the procurement of technologies, Requests for Proposals, and specifications. • Negotiate with the project partners to ensure that strategic business requirements of performance goals are met. • Hire and manage contractors. • Manage project through its lifecycle including testing and evaluation. Ensure that all is on budget and on time. • Work with industry in the deployment and testing of technologies. • Assist with the development & maintenance of strategic ITS/CVO business plans to ensure compatibility with adjoining states. • Understand motor carriers' operations and business models. • Work with industry and other states on technical and institutional issues for interoperability. 	<p><u><i>Awareness Level</i></u></p> <p>ITS/CVO Awareness; System Integration; System Analysis & Design; Software & Hardware Operations; Data Analysis & Management; Legal Issues; Telecommunications Networking Options; Electronics; Interoperability Testing for Conformance to the National ITS Architecture & Standards; System Testing.</p> <p><u><i>Specialized Level</i></u></p> <p>National ITS Architecture & CVO Component; ITS Standards; Planning; Identifying Stakeholders/Building Coalitions; Project Management; Technology Options; Financing; Procurement; Managing Contractors; Partnerships; Legislative & Policy Changes; Policy/Political Environment; Organizational/Institutional Issues; Writing/Communications; Marketing & Public Relations; Problem Solving; Project Evaluation.</p>

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Table 5A: Generic Staffing Chart for Deploying & Operating Safety Information Exchange, Electronic Credentialing, and Electronic Screening Systems (Core Staff) – Cont.

System Architect	<ul style="list-style-type: none"> • Conduct user needs assessment. • Analyze existing infrastructure. • Develop an "open systems" technical infrastructure that allows different ITS/CVO systems to communicate easily and consistently using common principles, data, and standards. • Monitor engineering and data gathering deliverables identified in contracts with vendors. • Oversee the Independent Validation and Verification process of the CVISN architecture to ensure nationwide compatibility. • Identify, develop, and implement policies having multi-agency applications regarding the design, installation, maintenance, and coordination of CVISN-related data systems. Map out data flows to users. • Design and manage the development of multiple data communication systems. • Identify, assess, and communicate to CVISN partners the impacts of current and developing technologies. Recommend technology choices. • Develop Requests for Proposals for technical projects. • Install or oversee the installment of ITS technologies, ensuring functionality and quality control. • Integrate technologies into existing system. • Work with other State and Federal personnel to ensure interoperability between CVISN deployment activities. • Train operators, maintenance, and support staff on system. • Participate in the development of national and international CVISN-related data communication standards. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; Human Factors; Telecommunications Networking Options; Electronics; Organizational/Institutional Issues; Legislative & Policy Changes; Software Development.</p> <p><u><i>Specialized Level</i></u> National ITS Architecture & CVO Component; System Integration; System Analysis & Design; Software & Hardware Operations; Data Analysis & Management; Technology Options; ITS Standards; Interoperability Testing for Conformance to the National ITS Architecture & Standards; System Testing; Problem Solving; Project Evaluation.</p>
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Table 5A: Generic Staffing Chart for Deploying & Operating Safety Information Exchange, Electronic Credentialing, and Electronic Screening Systems (Core Staff) – Cont.

Project Administrator/ Facilitator	<ul style="list-style-type: none"> • Develop and maintain a State CVISN Project Plan to keep important project factors current and focused. The Plan includes: project purpose, scope, objective; high-level system design baseline; organization; work breakdown structure, responsibilities and assignments; project management processes; deliverables and schedule; resources required; issues to be resolved. • Define and develop project status reports, prepare milestones and status summaries. • Schedule and lead project status meetings; prepare agenda. • Facilitate discussion at technical group meetings. • Assist the Project Manager and System Architect in providing administrative and technical oversight to projects, identifying problems and proposing actions to minimize risk. • Monitor project status, milestones, and deliverables. • Monitor engineering and data gathering deliverables required from vendors and other agencies. Suggest solutions to technical, budget, scheduling, and personnel issues. • Track project cost against budget. Coordinate fiscal status with Project Manager. • Communicate to CVISN partners the status of CVISN deployment, issues addressed, and lessons learned. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; Technology Options; ITS Standards; Data Analysis/Management; System Integration; System Analysis & Design; Software Development; Telecommunications Networking Options; Electronics; Interoperability Testing for Conformance to the National ITS Architecture & Standards; System Testing; Software & Hardware Operations.</p> <p><u><i>Specialized Level</i></u> National ITS Architecture & CVO Component; Planning; Organizational/Institutional Issues; Identifying Stakeholders/Building Coalitions; Partnerships; Marketing/Public Relations; Writing/Communications; Legislative & Policy Changes; Policy/Political Environment; Legal Issues; Project Management; Problem Solving; Project Evaluation.</p>
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Table 5A: Generic Staffing Chart for Deploying & Operating Safety Information Exchange, Electronic Credentialing, and Electronic Screening Systems (Core Staff) – Cont.

System Administrator	<ul style="list-style-type: none"> • Work with System Architect to ensure technical feasibility of design. • Assist in installation and testing of new hardware and software components. • Maintain network and server, including data archiving and backup. • Maintain and troubleshoot system problems. • Evaluate ITS project operations. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; ITS Legal Issues; Technology Options; Organizational/Institutional Issues; Legislative & Policy; Project Evaluation.</p> <p><u><i>Specialized Level</i></u> National ITS Architecture & CVO Component; Data Analysis & Management; ITS Standards; System Integration; System Analysis & Design; Software & Hardware Operations; Software Development; System Support & Maintenance; Interoperability Testing for Conformance to the National ITS Architecture & Standards; Testing & Inspection; Problem Solving; Project Evaluation.</p>
FHWA Division Field Staff	<ul style="list-style-type: none"> • Provide information about funding, Federal grant process to regional, state and local customers. • Assist the Project Manager to identify stakeholders and form coalitions and partnerships. • Provide technical guidance to customers. • Participate in Project Evaluation. • Ensure conformance with the National ITS Architecture and applicable standards. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; Planning; Technology Options; System Analysis & Design; Software & Hardware Options; Interoperability Testing for Conformance to the National ITS Architecture & Standards; System Testing; ITS Legal Issues; Procurement; Project Evaluation.</p> <p><u><i>Specialized Level</i></u> National ITS Architecture & CVO Component; ITS Standards; Legislative & Policy Changes; Data Analysis/Management; Identifying Stakeholders/Building Coalitions; Partnerships; Policy/Political Environment.</p>

Table 5A: Generic Staffing Chart for Deploying & Operating Safety Information Exchange, Electronic Credentialing, and Electronic Screening Systems (Core Staff) – Cont.

Motor Carrier Industry Representative	<ul style="list-style-type: none"> • Participate in CVISN working committees to supply private sector input. • Work with technology installers to test prototype products. • Provide input in project evaluation. 	<p><u>Awareness Level</u></p> <p>ITS/CVO Awareness; National ITS Architecture & CVO Component; ITS Standards; Partnerships; Technology Options; System Testing; Legislative & Policy Changes; ITS Legal Issues; Project Evaluation.</p> <p><u>Specialized Level</u></p> <p>None.</p>
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Table 5B: Generic Staffing Chart for Deploying & Operating Safety Information Exchange, Electronic Credentialing, and Electronic Screening Systems (Support Staff)

Ideal Team	Functions	Competencies
Software Developer	<ul style="list-style-type: none"> • Conduct needs assessment with on functional requirements. • Write new software to meet system needs or adapt off-the-shelf/existing software. • Work closely with the System Architect to ensure compatibility with CVISN Architecture and standards. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; System Analysis & Design; System Integration; System Support & Maintenance; Human Factors; Technology Options; ITS Legal Issues; Legislative & Policy Changes.</p> <p><u><i>Specialized Level</i></u> Software Development; Software & Hardware Operations; National ITS Architecture & CVO Component; Data Analysis/Management; ITS Standards; Interoperability Testing for Conformance to the National ITS Architecture & Standards; System Testing; Problem Solving.</p>
System Support & Maintenance Technician	<ul style="list-style-type: none"> • Work with System Architect and System Administrator to ensure technical feasibility of software and hardware design. • Maintain network and server. • Maintain software including data archiving and backup. • Assist System Architect and System Administrator with installation and testing. • Maintain and troubleshoot system problems. • Evaluate project operations. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; National ITS Architecture & CVO Component; System Integration; System Analysis & Design; Telecommunications Networking Options; Electronics; ITS Legal Issues; Technology Options; Project Evaluation.</p> <p><u><i>Specialized Level</i></u> Software and Hardware Operations; Systems Support and Maintenance; Data Analysis/Management; ITS Standards; Software Development; System Testing; Interoperability Testing for Conformance to the National ITS Architecture & Standards; Problem Solving.</p>

Table 5B: Generic Staffing Chart for Deploying and Operating Safety Information Exchange, Electronic Credentialing, and Electronic Screening Systems (Support Staff) – Cont.

Budget Officer	<ul style="list-style-type: none"> Develop and monitor a large program budget. Ensure that Federal and State contributions cover project expenditures when needed. 	<u><i>Awareness Level</i></u> ITS/CVO Awareness; Project Evaluation. <u><i>Specialized Level</i></u> Budgeting; Problem Solving.
Data(base) Manager/Analyst	<ul style="list-style-type: none"> Ensure that safety and credentials administration databases are maintained. These include data on vehicle registration, tax payments, special permits, and safety status information on carriers and vehicles. Generate reports when needed. 	<u><i>Awareness Level</i></u> ITS/CVO Awareness; National ITS Architecture & CVO Component; ITS Standards. <u><i>Specialized Level</i></u> Data Analysis/Management; Software & Hardware Operations; Software Development; System Testing; Interoperability Testing for Conformance to the National ITS Architecture & Standards.
Electrical Engineer	<ul style="list-style-type: none"> Work with System Architect and System Administrator to choose appropriate electrical hardware and software components that are compatible with legacy systems. Install electrical hardware and software components. Instruct Electronics Inspection and Maintenance Technicians on maintenance of electrical hardware and software components. 	<u><i>Awareness Level</i></u> ITS/CVO Awareness; National ITS Architecture & CVO Component; System Integration; ITS Standards; Software and Hardware Operations; Technology Options; Project Evaluation. <u><i>Specialized Level</i></u> Telecommunications Networking Options; Electronics; System Testing; Interoperability Testing for Conformance to the National ITS Architecture & Standards; Problem Solving.
Electronics Inspection & Maintenance Technician	<ul style="list-style-type: none"> Maintain electrical hardware and software components. 	<u><i>Awareness Level</i></u> ITS/CVO Awareness; National ITS Architecture & CVO Component; ITS Standards; Technology Options; System Integration; Project Evaluation. <u><i>Specialized Level</i></u> Telecommunications Networking Options; Electronics; Systems Support & Maintenance; System Testing; Interoperability Testing for Conformance to the National ITS Architecture & Standards; Problem Solving.

Table 5B: Generic Staffing Chart for Deploying and Operating Safety Information Exchange, Electronic Credentialing, and Electronic Screening Systems (Support Staff) – Cont.

ITS/CVO Champion	<ul style="list-style-type: none"> • Build awareness of CVISN program to State transportation stakeholders. • Build awareness of CVISN to other states considering CVISN deployment. • Give advice in writing State ITS/CVO Business Plans to other states. • Facilitate in building regional CVISN and other ITS/CVO programs. • Help identify roles that agencies and professionals play in deployment. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; System Integration; System Analysis & Design; Data Analysis/Management; Interoperability Testing for Conformance to the National ITS Architecture & Standards.</p> <p><u><i>Specialized Level</i></u> National ITS Architecture & CVO Component; ITS Standards; Identifying Stakeholders/Building Coalitions; Technology Options; Financing; Partnerships; Writing/Communications; Legislative & Policy Changes; Policy/Political Environment.</p>
FHWA Resource Center Specialist	<ul style="list-style-type: none"> • Provide information to officials of state, local and regional agencies on ITS/CVO initiatives. • Provide technical assistance on ITS/CVO infrastructure, interoperability, and deployment initiatives. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; System Integration; System Analysis & Design; Data Analysis/Management.</p> <p><u><i>Specialized Level</i></u> National ITS Architecture & CVO Component; ITS Standards; Interoperability Testing for Conformance to the National ITS Architecture & Standards; Identifying Stakeholders/Building Coalitions; Technology Options; Financing; Partnerships; Writing/Communications; Legislative & Policy Changes; Policy/Political Environment.</p>
State & Federal Legislators	<ul style="list-style-type: none"> • Make funding decisions regarding ITS/CVO programs. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; National ITS Architecture & CVO Component; ITS Standards; Technology Options.</p> <p><u><i>Specialized Level</i></u> Legislative & Policy Changes; Financing; ITS Legal Issues; Policy/Political Environment.</p>

Table 5B: Generic Staffing Chart for Deploying and Operating Safety Information Exchange, Electronic Credentialing, and Electronic Screening Systems (Support Staff) – Cont.

State Agency Decision Makers	<ul style="list-style-type: none"> • Make planning and operations decisions regarding ITS/CVO programs. • Participate in inter-agency ITS/CVO program teams. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; System Integration; System Analysis & Design; Data Analysis/Management; Technology Options; ITS Legal Issues; Procurement.</p> <p><u><i>Specialized Level</i></u> National ITS Architecture & CVO Component; ITS Standards; Interoperability Testing for Conformance to the National ITS Architecture & Standards; Identifying Stakeholders/Building Coalitions; Technology Options; Partnerships; Legislative & Policy Changes; Policy/Political Environment.</p>
Planner	<ul style="list-style-type: none"> • Research technology options. • Track/count ITS infrastructure already deployed. • Compile ITS benefits. • Identify ITS priorities for the jurisdiction. • Assist in writing project/business plans. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; System Analysis & Design; System Integration; Software Development.</p> <p><u><i>Specialized Level</i></u> Planning; National ITS Architecture & CVO Component; Identifying Stakeholders/Building Coalitions; Partnerships; Financing; Technology Options; Writing/Communications; Policy/Political Environment; ITS Legal Issues; Legislative & Policy Changes.</p>
Human Resources Staff	<ul style="list-style-type: none"> • Work with Project Manager to hire or develop ideal teams. • Facilitate new job descriptions. • Provide training. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; Legislative & Policy Changes; Policy/Political Skills.</p> <p><u><i>Specialized Level</i></u> Organizational/Institutional Changes; Identifying Stakeholders/Building Coalitions.</p>

Table 5B: Generic Staffing Chart for Deploying and Operating Safety Information Exchange, Electronic Credentialing, and Electronic Screening Systems (Support Staff) – Cont.

Contract Specialist	<ul style="list-style-type: none"> • Incorporate clauses in contracts to address ITS issues including software ownership and Intellectual Property Rights. • Ensure use of most appropriate contract type for deployment. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; National ITS Architecture & CVO Component; Data Analysis/Management; ITS Standards; Software Development; Technology Options; Partnerships.</p> <p><u><i>Specialized Level</i></u> Procurement; ITS Legal Issues; Writing/Communications; Legislative & Policy Changes.</p>
Legal Staff	<ul style="list-style-type: none"> • Review contracts for clauses and language supportive of ITS. • Review contracts for liability issues in design. • May participate in contract negotiations. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; National ITS Architecture & CVO Component; Data Analysis/Management; ITS Standards; Software Development; Technology Options; Legislative & Policy Changes.</p> <p><u><i>Specialized Level</i></u> ITS Legal Issues; Procurement; Writing/Communications; Partnerships.</p>

3.2 *Safety Information Exchange*

Safety information exchange allows public agencies and jurisdictions to exchange timely, current, accurate, and verifiable electronic safety information. Roadside operations can then focus on eliminating unsafe and illegal motor carrier operations without hindering the productivity and efficiency of safe and legal motor carriers and drivers. When inspections occur, they are conducted quickly with the aid of automated safety inspection equipment. The unique competencies and levels of knowledge associated with each of the roles, beyond those described in the generic staffing chart, are presented in Table 6.

Table 6: Project — Deploying & Operating Safety Information Exchange Systems**Unique Support Roles**

Ideal Team	Functions	Competencies
State & Local Motor Carrier Inspectors	<ul style="list-style-type: none"> Inspect motor carriers for safety and credentialing information. 	<p><u>Awareness Level</u> ITS/CVO Awareness; National ITS Architecture & CVO Component; ITS Standards.</p> <p><u>Specialized Level</u> State & Federal Motor Carrier Inspection Procedures and Processes; Partnerships; Legislative & Policy Changes.</p>

Unique Competencies

Ideal Competencies	Knowledge Level & Who Should Know
State & Federal Motor Carrier Inspection Procedures and Processes	<p><u>Awareness Level</u></p> <ul style="list-style-type: none"> System Architect; System Administrator; System Support & Maintenance Technician; Legal Staff; Contract Specialist; Planner. <p><u>Specialized Level</u></p> <ul style="list-style-type: none"> Project Manager; Project Administrator/Facilitator; FHWA Division Field Staff; Motor Carrier Industry Representative; Software Developer; ITS/CVO Champion; FHWA Resource Center Specialist; State & Federal Legislators; State Agency Decision Makers.

3.3 *Electronic Credentialing*

Electronic credentialing allows motor carriers to apply and pay for credentials electronically. This may include such transactions as:

- Base state agreements registration and taxes.
- Hazardous materials permits
- Oversize/overweight permits

With the free flow of information from one business process to another, it is expected that redundant data entry would be avoided, and improved data accuracy would be achieved.

The unique competencies and levels of knowledge associated with each of the roles, beyond Those noted in the generic staffing charts, are presented in Table 7.

Table 7: Project — Deploying & Operating Electronic Credentialing Systems**Unique Core Role**

Operations Supervisor for Tax & Vehicle Registration Programs	<ul style="list-style-type: none"> • Responsible for operations of tax and/or registration programs. • Ensure that State and Federal regulations pertaining to motor carrier programs are being followed. • Work with other programs to ensure consistency and to facilitate closer program cooperation for "one-stop" shopping initiatives. • Provide functional requirements input for technology procurement and software development modifications. • Manage operations user staff. • Provide on-the-job staff training on new procedures, processes, and technologies. • Resolve day-to-day staff and equipment problems. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; Planning; Technology Options; Software Development; System Analysis & Design; Data Analysis & Management; ITS Standards; Interoperability Testing for Conformance to the National ITS Architecture & Standards; System Testing.</p> <p><u><i>Specialized Level</i></u> National ITS Architecture & CVO Component; State & Federal Motor Carrier Tax & Vehicle Registration Regulations, Procedures & Processes; Legislative & Policy Changes; Managing Contractors; Software and Hardware Operations; Problem Solving.</p>
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Unique Support Role

Ideal Team	Functions	Competencies
Operations User for Tax & Vehicle Registration Programs	<ul style="list-style-type: none"> • Input tax and registration data into a computer for forms submitted manually. • Coach customers on new automated processes. • Identify software and hardware problems to information technology support staff. 	<p><u><i>Awareness Level</i></u> ITS/CVO Awareness; Software Development; National ITS Architecture & CVO Component; Technology Options; Legislative & Policy Changes.</p> <p><u><i>Specialized Level</i></u> State & Federal Motor Carrier Tax & Vehicle Registration Regulations, Procedures and Processes; Software and Hardware Operations; Marketing & Public Relations; Problem Solving.</p>

Table 7: Project – Deploying & Operating Electronic Credentialing Systems (cont.)

Unique Competencies

Ideal Competencies	Knowledge Level & Who Should Know
State & Federal Motor Carrier Tax & Vehicle Registration Regulations, Procedures & Processes	<p><i><u>Awareness Level</u></i></p> <ul style="list-style-type: none"> • System Architect; System Administrator; System Support & Maintenance Technician; Legal Staff; Contract Specialist; Planner. <p><i><u>Specialized Level</u></i></p> <ul style="list-style-type: none"> • Project Manager; Project Administrator/Facilitator; FHWA Division Field Staff; Motor Carrier Industry Representative; Software Developer; ITS/CVO Champion; FHWA Resource Center Specialist; State & Federal Legislators; State Agency Decision Makers.

3.4 Electronic Screening

Electronic screening is the use of advanced technologies to check commercial vehicles at highway speeds for safety status, and credential, tax, and permit information. As a vehicle equipped with a transponder approaches a weigh station with electronic screening, the transponder transmits vehicle, carrier, and specially regulated load type identifiers to roadside readers. The identifiers are used to access status information stored in government information systems. If a vehicle is in good standing, it is given a message to pass the weigh station. If not, it is requested to pull over. Carriers that participate in the program can operate without paper credentials on board and may save driving time. Public agency officials benefit by better safety, credentials, and tax enforcement.

The unique competencies and levels of knowledge associated with each of the roles for electronic screening beyond those noted in the generic staffing charts, are presented in Table 8.

Table 8: Project — Deploying & Operating Electronic Screening Systems

Unique Support Role

Ideal Team	Functions	Competencies
State & Local Motor Carrier Inspectors	<ul style="list-style-type: none"> Inspect motor carriers for safety and credentialing information. 	<p><u>Awareness Level</u> ITS/CVO Awareness; National ITS Architecture & CVO Component; ITS Standards.</p> <p><u>Specialized Level</u> State & Federal Motor Carrier Inspection Procedures and Processes; Partnerships; Legislative & Policy Changes.</p>

Unique Competencies

Ideal Competencies	Knowledge Level & Who Should Know
State & Federal Motor Carrier Inspection Procedures and Processes	<p><u>Awareness Level</u></p> <ul style="list-style-type: none"> System Architect; System Administrator; System Support & Maintenance Technician; Legal Staff; Contract Specialist; Planner. <p><u>Specialized Level</u></p> <ul style="list-style-type: none"> Project Manager; Project Administrator/Facilitator; FHWA Division Field Staff; Motor Carrier Industry Representative; Software Developer; ITS/CVO Champion; FHWA Resource Center Specialist; State & Federal Legislators; State Agency Decision Makers.

3.5 Motor Carrier Operations

Motor carriers are able to equip their vehicles with a variety of productivity and safety improvements such as mobile communications systems, navigation and tracking systems, on-board vehicle monitors, collision avoidance devices, crash restraints, and vision enhancement equipment. Standards are available to support cross carrier queries and tracking so a shipper can find the location of their shipment via an electronic query. As well, a small number of trucks are equipped with Dedicated Short Range Communication (DSRC) transponders that transmit messages to and receive messages from the roadside for safety inspection purposes. All these technologies are used to optimize schedules, routing, load capacities, and to increase safety.

The OMCHS role in motor carrier operations is to promote the use of products using accepted ITS standards to ensure national system interoperability. State regulatory agencies should continue to work with motor carriers so state systems can integrate with existing motor carrier systems.

Table 9: Project — Motor Carrier Operations (Core Staff)

Ideal Team	Functions	Ideal Competencies
FHWA Division Field Staff	<ul style="list-style-type: none"> • Provide information about funding and the Federal grant process to regional, state and local customers. • Identify stakeholders and form coalitions and partnerships. • Understand motor carrier use of technology to integrate with state systems. • Provide information on new accepted ITS Standards and National ITS Architecture & CVO Component developments. • Ensure conformance with the National ITS Architecture and applicable standards. 	<p><u>Awareness Level</u> ITS/CVO Awareness; Planning; Technology Options; Data Analysis/Management; Procurement; Project Evaluation.</p> <p><u>Specialized Level</u> National ITS Architecture & CVO Component; ITS Standards; Legislative & Policy Changes; Identifying Stakeholders/Building Coalitions; Partnerships; Policy/Political Environment; Interoperability Testing for Conformance to the National ITS Architecture & Standards.</p>
ITS/CVO Champion	<ul style="list-style-type: none"> • Build awareness of National ITS Architecture & CVO Component and ITS Standards to private vendors and operators. • Help identify roles that agencies and professionals play in motor carrier operations. 	<p><u>Awareness Level</u> ITS/CVO Awareness; Data Analysis/Management.</p> <p><u>Specialized Level</u> National ITS Architecture & CVO Component; ITS Standards; Interoperability Testing for Conformance to the National ITS Architecture & Standards; Identifying Stakeholders/Building Coalitions; Technology Options; Planning; Financing; Partnerships; Writing/Communications; Policy and Legislative Changes; Policy/Political Environment.</p>
FHWA Resource Center Specialist	<ul style="list-style-type: none"> • Provide information on new accepted ITS Standards and National ITS Architecture & CVO Component developments. • Provide technical guidance to customers. 	<p><u>Awareness Level</u> ITS/CVO Awareness; Planning; Technology Options; System Testing; ITS Legal Issues; Procurement; Project Evaluation.</p> <p><u>Specialized Level</u> National ITS Architecture & CVO Component; Interoperability Testing for Conformance to the National ITS Architecture & Standards; Legislative & Policy Changes, Data Analysis/Management; ITS Standards; Identifying Stakeholders/Building Coalitions; Partnerships; Policy/Political Environment.</p>

Table 9: Project — Motor Carrier Operations (Core Staff) – (cont.)

Motor Carrier Industry Representative	<ul style="list-style-type: none"> • Participate in ITS/CVO discussions on freight and fleet management technologies. • Provide input on legislative and policy changes. 	<p><u>Awareness Level</u> ITS/CVO Awareness; National ITS Architecture & CVO Component; ITS Standards; Partnerships; Technology Options; Interoperability Testing for Conformance to the National ITS Architecture & Standards; Data Analysis/Management; Legislative & Policy Changes.</p> <p><u>Specialized Level</u> None</p>
Project Manager	<ul style="list-style-type: none"> • Understand motor carriers' operations and business models. • Build coalitions and partnerships. 	<p><u>Awareness Level</u> ITS/CVO Awareness</p> <p><u>Specialized Level</u> National ITS Architecture & CVO Component; ITS Standards; Identifying Stakeholders/Building Coalitions; Technology Options; Partnerships.</p>
Operations Supervisors for Tax & Vehicle Registration Programs	<ul style="list-style-type: none"> • Understand motor carriers' operations and business models. • Explain changes in tax and vehicle registration, regulations, procedures, and processes. • Work directly with motor carriers on tax and vehicle registration issues. 	<p><u>Awareness Level</u> ITS/CVO Awareness; Technology Options; ITS Standards.</p> <p><u>Specialized Level</u> National ITS Architecture & CVO Component; State & Federal Motor Carrier Tax & Vehicle Registration Regulations, Procedures & Processes.</p>

4.0 SUMMARY

As part of the *ITS Training & Education Needs Analysis*, interviewees were asked what ITS-related subjects they needed information on, who needed that information, and what was the best way to deliver the material. The information that was gathered from the interviews provided insights on the roles and competencies required in ITS projects and how the ITS/PCB Program could be expanded to more effectively deliver that information. This data has been combined with information from other commercial vehicle studies and interviews, OMCHS materials, and an examination of ITS/PCB and ITS/CVO Program course offerings and delivery methods to form this report's preliminary analysis of commercial vehicle professional capacity building needs.

This preliminary analysis concludes the following:

1. The *ITS Training & Education Needs Analysis* results can be used to establish a framework to identify ITS/CVO education and training needs. Additional information from ITS/CVO studies and interviews and OMCHS materials can be used to begin distinguishing ITS/CVO education and training needs from other ITS project needs.
2. This framework and information can be used to develop basic staffing charts to guide decision makers in designing, staffing, and hiring ideal ITS/CVO project teams, presented in Section 3 of this report.
3. A preliminary assessment of the gap between ITS/CVO training and education needs and available resources has been done using this framework. This assessment revealed that much relevant information and training resources are available to decision makers to *initiate* organizational professional capacity building to provide a solid awareness and overview, with some more specialized and technical areas. However, areas that can be further developed include:
 - General ITS/PCB Program courses and seminars should include more ITS/CVO examples and case studies to assist professionals involved in other ITS areas to broaden their scope to include ITS/CVO. ITS/CVO case studies provide relevant examples of critical topics such as interstate and inter-agency stakeholder and building coalition activities.
 - ITS/CVO training courses could modify general ITS/PCB courses to target them to ITS/CVO professionals directly. For example, content covered in the courses "ITS Telecommunications Analysis" and "ITS Public/Private Partnerships" are relevant to commercial vehicle operations.
 - Current ITS/CVO training courses could include lessons learned from ITS/CVO deployment sites. There are several CVISN States that are at the final stage of deployment and have noteworthy lessons learned to share with other states just beginning the CVISN program.
 - The ITS/CVO training program will need to develop and offer additional specialized courses that meet the needs of emerging areas such as Interoperability Testing for National ITS Architecture Conformance & ITS Standards.

- Delivery methods need to expand. For example, the ITS/PCB Program web page should include ITS/CVO training courses. In the longer term, ITS/CVO training and education needs should be addressed through the virtual learning environment being established by the ITS/PCB Program. As well, the Peer-to-Peer Network should be widely publicized to ITS/CVO stakeholders as a source for technical assistance.
4. Gaps identified in this report need to be further explored in more detail to establish their breadth and depth. This can best be done through interviews with ITS/CVO practitioners in order to:
- Validate ITS/CVO roles and competencies. Interviews with ITS/CVO practitioners will refine the roles and competencies outlined in this report and make them more specific to ITS commercial vehicle activities. The same should be done regarding awareness vs. specialized competency areas in the staffing charts. Further work is especially needed to refine Motor Carrier Operations and begin the Electronic Toll Collection staffing charts.
 - Gather ITS/CVO examples and case studies that can be included in ITS/PCB Program and ITS/CVO Program courses.
 - Collect data that will assist in the development of new courses in Interoperability Testing for Conformance to the National ITS Architecture & Standards and emerging needs such as future ITS Standards and ITS/CVO project management and performance monitoring.
 - Determine top 10 priority competency needs for ITS/CVO practitioners. This will enable the ITS/CVO Program and ITS/PCB Program to plan for future developments.
 - Determine priorities for ITS/CVO delivery methods. There has been no research in this area yet.

In doing so, the ITS/PCB and ITS/CVO Programs can then expand to include courses that address emerging needs as well as refine existing courses to ensure that they are tailored, targeted, and accessible to ITS/CVO practitioners.

5.0 RECOMMENDED ACTIONS

Based on the report summary, the following action items are recommended:

- ***Conduct a more in-depth needs assessment of ITS/CVO roles, competencies, and delivery methods to address gaps noted in points 3 and 4 in the report summary.*** This will lay the foundation for future modifications to existing ITS/PCB and ITS/CVO Program offerings.
- ***Enhance current training by modifying existing ITS/PCB Program courses and developing ITS/CVO courses that are tailored and targeted to ITS/CVO practitioners' needs.*** Such modifications could include case studies from ITS/CVO deployment sites and other recommendations gathered from a future ITS/CVO needs assessment.
- ***Provide ITS/CVO course offerings which cater to the awareness and specialized needs of professionals in emerging areas such as:***
 - ***Interoperability Testing for National ITS Architecture Conformance.*** Since conformance with the National ITS Architecture is required of all Federally-funded ITS projects, such a course will be highly in demand. FHWA Division Field Staff and FHWA Resource Center Specialists should be the first participants in this course since they are responsible for providing information and technical assistance on this topic.
 - ***Electronic Data Interchange (EDI) and eXtensible Markup Language (XML).*** Currently EDI is the standard required to be in conformance with the CVO component of the National ITS Architecture. However, XML is anticipated to be an alternative to EDI in the future. ITS/CVO professionals will need to be knowledgeable of this new accepted standard and its applications.
 - ***Project Management & Performance Monitoring Course.*** Such a course would include segments on how to monitor a project's progress within budget. This is important for ITS/CVO project managers who currently oversee CVISN deployments.
- ***Publicize the Peer-to-Peer Network Program to motor carrier stakeholders.*** A first step could be to have FHWA Division Field staff and FHWA Resource Center Specialists regularly communicate the availability of this resource to their customers.
- ***Expand the ITS/PCB program's creation of virtual learning environments to include ITS/CVO courses and resources.*** ITS/PCB courses will be available on the web as "informational presentations" in September 1999. The web site could also include ITS/CVO courses and workshops. This would meet the audience's interest in receiving knowledge and specific information about technologies, applications, and deployments on an on-demand basis. It would also be a good resource for general awareness outreach.

Appendix A: Overview of the Roles Unique to ITS/CVO

Roles	Expectations/Contributions
Project Manager	This individual oversees the development of the CVISN Project Plan working with multiple state agencies. This person also ensures that the Project Plan is interoperable with the National ITS Architecture. He/she staffs, budgets, and schedules project activities and manages the project through its life.
System Architect	This person analyzes the existing state architecture, conducts needs requirements of different state agencies, and proposes technology options, and architecture modifications. He/she supervises integration of system components and ensures that the system architecture is compatible with the National ITS Architecture.
ITS/CVO Champion	This individual promotes awareness of ITS/CVO and its benefits to decision makers—both elected legislators and appointed agency heads, agency staff, and the public. Often the project manager plays this role.
Project Facilitator/Administrator	A state employee or consultant that assists in developing and maintaining a State CVISN Project Plan. He/she also defines and develops project status reports and tracks scheduling and budget costs.
FHWA Resource Center Specialist	This technical expert on ITS/CVO infrastructure, interoperability, and deployment initiatives, provides technical assistance and training to officials of state, local, and regional agencies.
Motor Carrier Industry Representative	This representative from industry works with the public sector to ensure the smooth integration of CVISN with motor carriers' existing information systems.
State & Federal Legislators	These individuals approve funding for ITS/CVO projects. They thus need to be informed about ITS/CVO technology choices and benefits.
State Agency Decision Maker	These individuals approve the design and scope of ITS/CVO projects. This role includes line officers, middle management, senior chief administration officers, and agency heads.
System Administrator	Often this individual is from the State's transportation department of information and works closely with the system architect to design and implement modifications to the state transportation system architecture. He/she is also in charge of maintaining the state's architecture.

Appendix A: Overview of the Roles Unique to ITS/CVO – Cont.

Roles (cont'd)	Expectations/Contributions (cont'd)
Budget Officer	This individual monitors the project's budget which includes paying vouchers, matching budget requirements with revenue sources, tracking the flow of money and ensuring that Federal and State revenue contributions cover the budget cycles when money inflows are needed.
Operations Supervisor for Tax & Vehicle Registration Programs	This person oversees tax and/or vehicle registration program operations for electronic credentialing.
Operations User for Tax and Vehicle Registration Programs	This individual assists motor carriers in doing electronic credentialing and tax payments.
State & Local Motor Carrier Inspectors	These are public employees who are responsible for roadside safety inspection, size, weight, and credentials enforcement. They must be comfortable users of the integrated systems to be able to meet performance objectives.
Electrical Engineer	This person, often a consultant, designs and installs hardware and software components. He/she also provides protocols for their inspection and maintenance.

Appendix B: Overview of Competencies Unique to ITS/CVO

Competency	Definition
ITS/CVO Awareness	Awareness of the diverse ITS/CVO technologies, their usefulness and benefits in solving transportation problems.
National ITS Architecture & CVO Component	Understanding of the elements of the National ITS Architecture and its CVO component (also known as CVISN), since Federally funded projects must be in conformance with the Architecture.
System Integration	Understanding of the linkage of different technologies involved in different deployments. For example, the integration of Safety Information Exchange with Electronic Credentialing technologies.
Electronics	Knowledge of basic electronics and their design, installment, and maintenance procedures.
Budgeting	Knowledge of basic budgeting techniques to be able to develop and monitor a program budget.
State & Federal Motor Carrier Tax & Vehicle Registration Regulations, Procedures, and Processes	Knowledge of State's tax structure as well as Federal and State vehicle registration procedures and processes. Knowledge of the base state agreements—International Registration Program and International Fuel Tax Agreements—their requirements and procedures.
State and Federal Motor Carrier Inspection Procedures and Processes	Knowledge of State and Federal inspection processes and procedures.
System Testing	This includes unit, component, and end-to-end testing. System testing must be done before interoperability testing begins.
Telecommunications Networking Options	Knowledge of Local Area Networks and Wide Area Networks. Awareness of security and firewall issues.
Interoperability Testing for Conformance to the National ITS Architecture & Standards	This ensures that state system architectures are in conformance with the National ITS Architecture & Standards—a requirement for Federally-funded projects.

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**Publication No. FHWA-OP-99-033
Also, DOT-VNTSC-FHWA-99-7**